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| EXAMINER | |
|---|---|
| SINGH, HIRDEPAL | |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. 10/520,383 | Applicant(s) COERSMEIER, EDMUND |
| --- | --- | --- |
| | Examiner Hirdepal Singh | Art Unit 2611 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *19 November 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 November 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

1. This action is in response to the Amendment filed on November 19, 2007. Claim 16 is added, now claims 1-16 are pending and have been considered below.

### *Response to Arguments*

2. The Amendment has correctly described the block in the drawing figures. Therefore, the objection to the figures is withdrawn.

3. The Amendment has corrected the typographical error in the specification on page 4, related to the second oscillator 45 connected to the mixer 40 in figure 1. Therefore, the objection to the specification is withdrawn.

4. Applicant's arguments filed November 19, 2007 have been fully considered but they are not persuasive.

5. Applicant admits that the prior art of record Wright et al. (US 6,313,703) provides a pre-equalizing function (Amendment page 8, lines 1-4) but, argues that the prior art doesn't teach, obtaining a difference between an output signal of signal processing circuitry and an input signal of a pre-equalizing function and "approximating a gradient of said difference..." The approximation is based on "said obtained difference and an approximation of said transmission characteristic." and further states that "...the compensation parameters are not updated..." also that "...Wright has a training sequence and an antenna switch rather than the features of the rejected claims.

Payload data in Wright is used to calculate a training sequence rather than the approximated gradient. Thus, the payload data transmission is interrupted in Wright, and there is a physical cut off in file data path by an antenna switch in Wright. Wright thus relies upon file conventional use of training signals and an antenna switch, and is mutually exclusive of the features recited in amended independent claims l, 11 and 16.

6. Examiner respectfully traverses Applicant's opinion as Wright discloses obtaining a difference between an output signal of signal processing circuitry and an input signal of a pre-equalizing function (clearly shown in figure 21; column 31, lines 15-26 and 45-55 “the output signal and input of pre-equalizer are compared to update the compensation parameters; also equation 22 in column 32 clearly shows that the difference between input and output signal is calculated"), and further that the compensation parameters are updated based on the difference between input and output, based on any of the methods as least mean square gradient calculation as described in the specification of present Application (clearly shown in column 23, lines 60-67; also in column 19, lines 38-44, the adaptation of control parameters is based on the described logics; columns 53-54, see step 2). Therefore, the cited reference Wright et al. discloses all the claimed limitation, so the rejection to Claims 1-15 is not withdrawn.

7. Applicant argues that the rejection does not establish a prima facie case that the applied references suggest a method having each and every one of the combination of features recited in claims 3, 9 and 10. Dependent claim 3 additionally requires that the gradient vector is calculated "from a partial differential equation of a system cost

function" and claims 9 and t 0 additionally require that the gradient vector is calculated using a specified equation (not repeated here for brevity). The rejection acknowledges that Wright does not include either one of these features, but apparently asserts that it would have been obvious to modify Wright to include equations 20, 24-26, 38-39 and 43 from the Boudreau reference. However, the rejection does not make clear whether the Boudreau reference is asserted to make a teaching or suggestion of the proposed modification of Wright, or whether there is some other rationale for the proposed modification of Wright. Thus, the rejection fails to establish a prima facie case of obviousness.

8. Examiner respectfully traverses Applicant's opinion as the cited reference Daniel et al in the same field of endeavor discloses an adaptive filter using gradient based time delay estimation and further discloses that the gradient i.e. the function for updating the adaptation coefficients is in the form of a differential equation (page 3167, equations 24-26, 38-39). One of ordinary skill in the art would have clearly recognized that the use of partial differential equation of system cost function to get the gradient vector for updating adaptation coeffients to take advantage of partial differential equations as they are used to formulate and solve problems that involve unknown functions of several variables as in this case the filter circuit characteristics, temperature changes and supply voltage, and to update the adaptation values based on the gradient of the difference between output and input values where the input is a delayed function to make the adaptation coefficients which reflects the distortions and discrepancies in the filtering circuit when the error/difference signal is compared to the delayed input signal,

to keep track of the time varying delays in the path of signals going through separate processes. therefore, the combination of both the reference is obvious for the reasons as above, so the rejection to the claims 3, 9-10 is not withdrawn.

## *Claim Rejections - 35 USC § 102*

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. Claims 1, 2, 4-8 and 11-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Wright et al. (US 6,313,703).

**Regarding Claims 1, 11 and 16:**

Wright et al discloses a method and system of pre-equalizing a transmission characteristic of a signal processing circuitry by introducing a pre-distortion of the signal, comprising:

obtaining a difference between an output signal of said signal processing circuitry and an input signal of an pre-equalizing function (figure 20; figure 21; column 31, lines 15-26 and 45-55; equation 22 in column 32);

approximating a gradient of said difference based on said obtained difference and an approximation of said transmission characteristic (column 21, lines 15-20; equations 22-24 in column 32; column 23, lines 60-67; column 19, lines 38-44; columns 53-54, see step 2); and

updating control values of said equalizing function (column 4, lines 38-42; column 9, lines 5-11) based on said approximated gradient.

**Regarding Claim 2:**

Wright et al discloses all of the subject matter as described above and further discloses calculating an approximation of a least mean square gradient vector (column 23, lines 62-65) of said difference.

**Regarding Claims 4 and 12:**

Wright et al discloses all of the subject matter as described above and further discloses the difference or error is obtained by comparing signal envelopes of said output and input signals (figures 20 and 221; column 31, lines 35-42).

**Regarding Claim 5:**

Wright et al discloses all of the subject matter as described above and further discloses input signal is a digital signal and said output signal is an analog signal (12 and 18 in figure 2; column 4, lines 10-16).

**Regarding Claim 6:**

Wright et al discloses all of the subject matter as described above and further discloses the control values are coefficients of an adaptive digital filter (92, 93 in figure 9 are digital filters; figure 10A shows coefficients of filters).

**Regarding Claim 7:**

Wright et al discloses all of the subject matter as described above and further discloses the transmission characteristic is approximated as a delay function (as clearly shown if figure 13 which is block 28 of figure 2; column 22, lines 50-62, where the signal values are filled in memory to hold i.e. delayed before further processing).

**Regarding Claim 8:**

Wright et al discloses all of the subject matter as described above and further discloses the delay function corresponds to the position of the maximum analog filter peak of said transmission characteristic (column 25, lines 30-34).

**Regarding Claim 13:**

Wright et al discloses all of the subject matter as described above and further discloses calculating an approximation of a least mean square gradient vector (column 23, lines 62-65) of said difference and the transmission characteristic is approximated as a delay function (as clearly shown if figure 13 which is block 28 of figure 2; column

22, lines 50-62, where the signal values are filled in memory to hold i.e. delayed before further processing).

**Regarding Claim 14:**

Wright et al discloses all of the subject matter as described above and further discloses signal processing circuitry is a direct conversion (column 10, lines 15-22) or heterodyne transmitter architecture.

**Regarding Claim 15:**

Wright et al discloses all of the subject matter as described above and further discloses the apparatus comprises a digital pre-equalizer means (clearly shown in figure 2, the pre-equalizing means for pre distorting the signal is in the digital domain).

***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 3 and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wright et al. (US 6,313,703) as applied to claims 1, 2, 7 and 8 above, in view of

Daniel et al. ("JOINT GRADIENT-BASED TIME DELAY ESIMATION AND ADAPTIVE FILTERING" IEEE CH2868; pages 3165-3169; 1990)

**Regarding Claim 3:**

Wright et al discloses all of the subject matter as described above except for specifically teaching the gradient vector is calculated from a partial differential equation of a system cost function.

However, Daniel et al in the same field of endeavor discloses an adaptive filter using gradient based time delay estimation and further discloses that the gradient i.e. the function for updating the adaptation coefficients is in the form of a differential equation (page 3167, equations 24-26, 38-39).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use the partial differential equation of system cost function to get the gradient vector for updating adaptation coeffients to take advantage of partial differential equations as they are used to formulate and solve problems that involve unknown functions of several variables as in this case the filter circuit characteristics, temperature changes and supply voltage. Using the partial differential equation to formulate the gradient based on the error value of input and output signals makes it easier to keep the adaptation means updated.

**Regarding Claim 9:**

Wright et al discloses all of the subject matter as described above except for specifically teaching the gradient vector is calculated using the following equation:

$\nabla\{E\} = -2e[k].\ d[k-x]$,

wherein $\nabla\{E\}$ denotes said gradient vector, e[k] denotes said obtained difference, and d[k - x] denotes a vector representation of said input signal assessed by said delay approximation of said transmission characteristic.

However, Daniel et al in the same field of endeavor discloses an adaptive filter using gradient based time delay estimation where the filter coefficients are updated according to the equation $E[Wn + 1] = E[Wn] + 2\mu E[e(n,dn)\ Un]$, where $e_n$ is the error/difference signal and Un is a delayed input vector (page 3167, equation 43). This equation can be written in the form of a gradient i.e. in the form of ratio of different variables where $E[Wn + 1] - E[Wn] = 2\mu E[e(n, dn)\ Un]$ and the gradient vector is calculated.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to update the adaptation values based on the gradient of the difference between output and input values where the input is a delayed function in order to make the adaptation coefficients which reflects the distortions and discrepancies in the filtering circuit when the error signal is compared to the delayed input signal, to keep track of the time varying delays in the path of signals going through separate processes.

**Regarding Claim 10:**

Wright et al discloses all of the subject matter as described above except for specifically teaching the filter coefficients are updated in said updating step based on the following equation:

$w[k + 1] = w[k] + \mu e[k] \cdot d[k- \tau]$,

wherein $w[k + 1]$ denotes a vector representation of updated filter coefficients, $w[k]$ denotes a vector representation of current filter coefficients, and $\mu$ denotes a predetermined proportionality factor.

However, Daniel et al in the same field of endeavor discloses an adaptive filter using gradient based time delay estimation where the filter co-efficients are updated according to the equation $w[n + 1] = w[n] + 2\mu e^* Un$, where Un is a delayed input vector (page 3166, equation 20).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to update the adaptation coefficients based on the previous value and the error signal and the delayed input signal in order to make it easier for the system just to update the previous coefficients and not to determine the new ones as just making the required changes in the previous value saves some extra calculation and time and makes the system less complex.

## *Conclusion*

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hirdepal Singh whose telephone number is 571-270-1688. The examiner can normally be reached on Mon-Fri (Alternate Friday Off)8:00AM-5:00PMEST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shuwang Liu can be reached on 571-272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HS
January 8, 2008

Shuwang Liu

SHUWANG LIU
SUPERVISORY PATENT EXAMINER